Claims

[c1] A device comprising:

a substrate with a device region;

a cap for encapsulating the device, the cap creates a cavity over the device region; and

spacer particles on the substrate to support the cap, the spacer particles comprising a base and an upper portion, the base being at least equal to or wider than the upper portion.

[c2] The device of claim 1 wherein the device region comprises one or more cells.

[c3] The device of claim 2 wherein the cells comprise at least one organic layer formed between lower and upper electrodes.

[c4] The device of claim 3 wherein the lower electrodes are anodes and the upper electrodes are cathodes.

[c5] The device of claim 3 wherein the upper electrodes are anodes and the lower electrodes are cathodes.

[c6] The device of claim 3 wherein the spacer particles comprise a half-spherical shape.

[c7] The device of claim 3 wherein the spacer particles comprise a pyramidal, cubical, prism, regular or irregular shape.

[c8] The device of claim 3 wherein the spacer particles comprise a non-conductive material.

[c9] The device of claim 8 wherein the spacer particles comprise glass, silica, polymers, ceramic or photoresist.

[c10] The device of claim 8 wherein the spacer particles comprise an average diameter to maintain the height of the cavity.

[c11] The device of claim 10 wherein the spacer particles comprise a density to maintain separation between the cap and the device region.

[c12] The device of claim 11 wherein the density is about 10 1000 No/mm ^{2}.

[c13] The device of claim 12 wherein an average distance between the spacer particles is about 100 500 μ m.

[c14] The device of claim 1 wherein the spacer particles comprise a half-spherical shape.

[c15] The device of claim 1 wherein the spacer particles comprise a pyramidal, cubical, prism, regular or irregular shape.

[c16] The device of claim 14 wherein the spacer particles comprise a non-conductive material.

[c17] The device of claim 16 wherein the spacer particles comprise glass, silica, polymers, ceramic or photoresist.

[c18] The device of claim 17 wherein the spacer particles comprise an average diameter to maintain the height of the cavity.

[c19] The device of claim 18 wherein the spacer particles comprise a density to maintain separation between the cap and the device region.

[c20] The device of claim 19 wherein the density is about 10 1000 No/mm ^{2}.

[c21] The device of claim 20 wherein an average distance between the spacer particles is about 100 500 μ m.

[c22] A method for forming a device, comprising:
providing a substrate with a device region;
applying a layer of adhesive on spacer particles, the spacer particles comprising a base and an upper portion, the base being at least equal to or wider than the upper portion;
depositing the spacer particles on the substrate;
curing the layer of adhesive on the spacer particles; and
mounting a cap on the substrate to encapsulate the device, the cap forms a cavity over the device region, the cavity maintained by the spacer particles.

[c23] The method of claim 22 wherein the device comprises an OLED device.

[c24] The method of claim 23 wherein the spacer particles comprise a non-conductive material.

[c25] The method of claim 24 wherein the step of depositing the spacer particles comprises dry spraying.

[c26] The method of claim 25 wherein the spacer particles occupy active and non-active parts.

[c27] The method of claim 25 wherein the spacer particles occupy non-active parts.

[c28] The method of claim 25 wherein coverage of the spacer particles on the substrate is patterned by photolithography technology.

[c29] The method of claim 25 wherein coverage of the spacer particles on the substrate is patterned by shadow mask technology.

[c30] The method of claim 25 wherein coverage of the spacer particles on the substrate is patterned by dry resist technology.

[c31] The method of claim 24 wherein the step of depositing the spacer particles comprises wet spraying.

[c32] .The method of claim 31 wherein the spacer particles occupy active and non-active parts.

[c33] The method of claim 31 wherein the spacer particles occupy non-active parts.

[c34] The method of claim 31 wherein coverage of the spacer particles on the substrate is patterned by photolithography technology.

[c35] The method of claim 31 wherein coverage of the spacer particles on the substrate is patterned by shadow mask technology.

[c36] The method of claim 24 wherein the step of depositing the spacer particles comprises spin coating, doctor blading, screen printing or transfer printing.

[c37] The method of claim 24 wherein the adhesive comprises thermal curable

material.

[c38] The method of claim 24 wherein the adhesive comprises ultraviolet curable material.

[c39] The method of claim 24 wherein the adhesive comprises hot melt material.

[c40] A method for forming a device, comprising:
providing a substrate with a device region;
forming a plurality of spacer particles on the substrate, the spacer particles comprising a base and an upper portion, the base being at least equal to or wider than the upper portion; and
mounting a cap on the substrate to encapsulate the device, the cap forms a cavity over the device region, the cavity maintained by the spacer particles.

[c41] The method of claim 40 wherein the step of forming a plurality of spacer particles on the substrate comprises:
depositing particles on the substrate; and
heating the particles to a high temperature to cause the particles to reflow into the spacer particles having the base at least equal to or wider than the upper portion.

[c42] The method of claim 40 wherein the step of forming a plurality of spacer particles on the substrate comprises:
depositing a photoresist on the substrate; and
patterning the photoresist into the spacer particles having the base at least equal to or wider than the upper portion.